Coastal ecosystem responses to influences from land and sea

US Geological Survey

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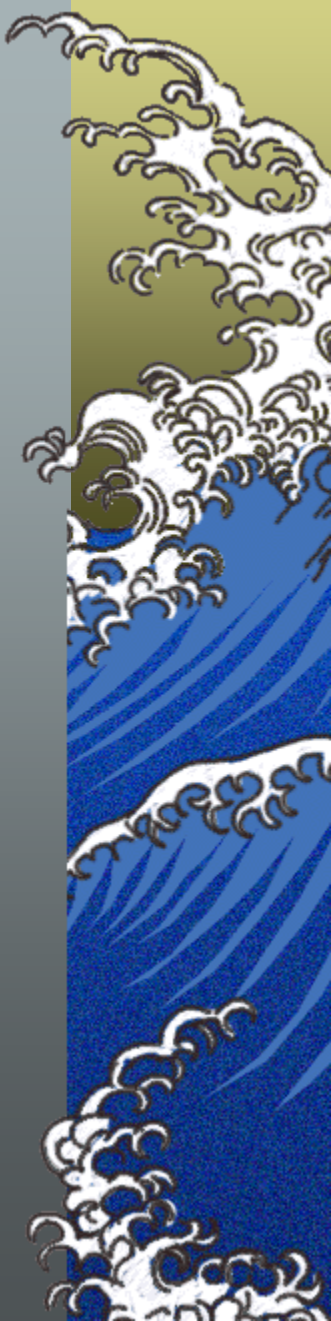

Coastal ecosystem responses to influences from land and sea

Partners

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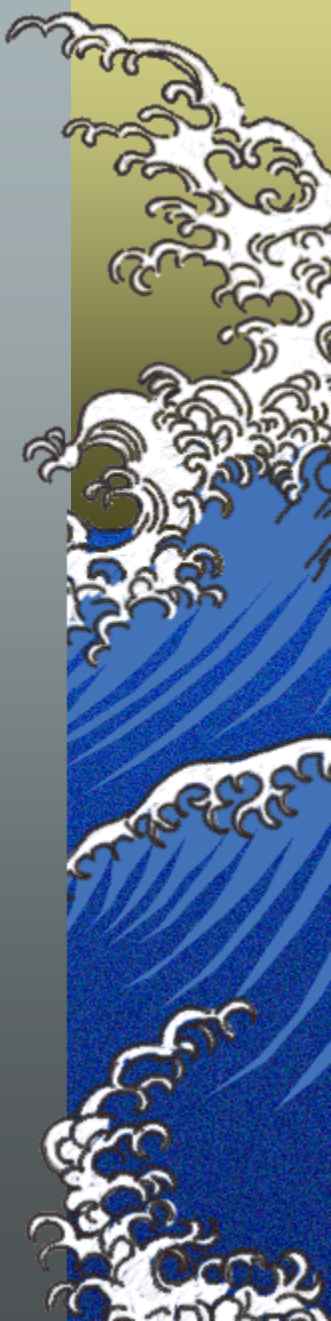
North Pacific Research Board
Exxon Valdez Oil Spill Trustee Council
USFWS
California Dept. Fish and Game
California Coastal Conservancy

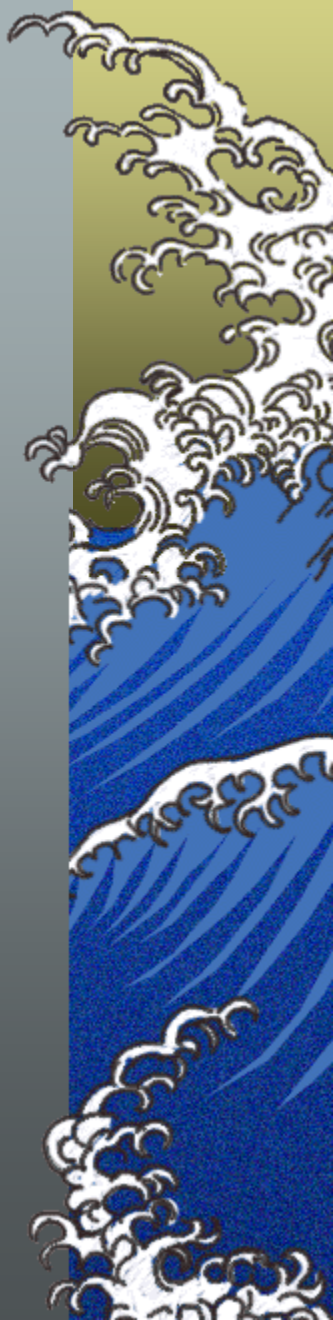
USGS



Pacific Nearshore Project

The Question:

What factors are contributing to the status and trends of contemporary sea otter populations, and by extension to nearshore ecosystems more generally?



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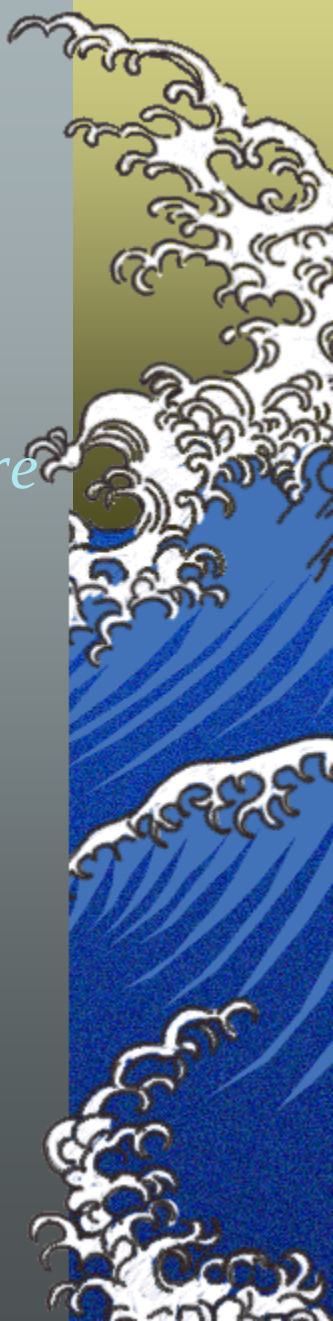
Status of the sea otter and coastal marine ecosystems

- *Trends in abundance span wide range, many diminished, few increasing at Rmax*
- *Some populations exhibit divergent trends within (core and periphery sub-populations)*
- *Influences in the Nearshore (various sources and scales)*
  - *Density dependent factors*
  - *Watershed influences*
  - *Oceanic influences*
- *Pacific Nearshore Project*



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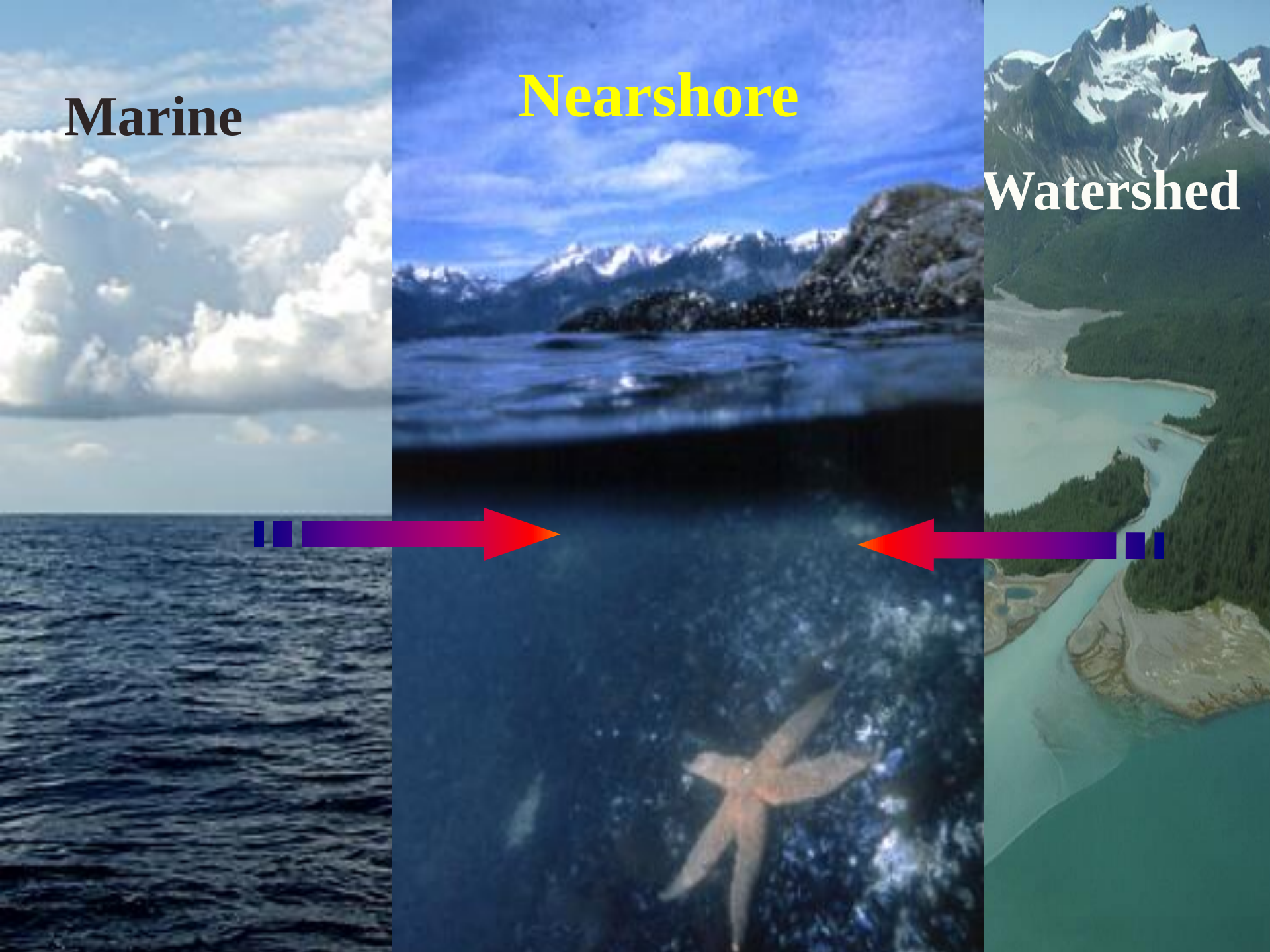

Marine
Nearshore
Watershed

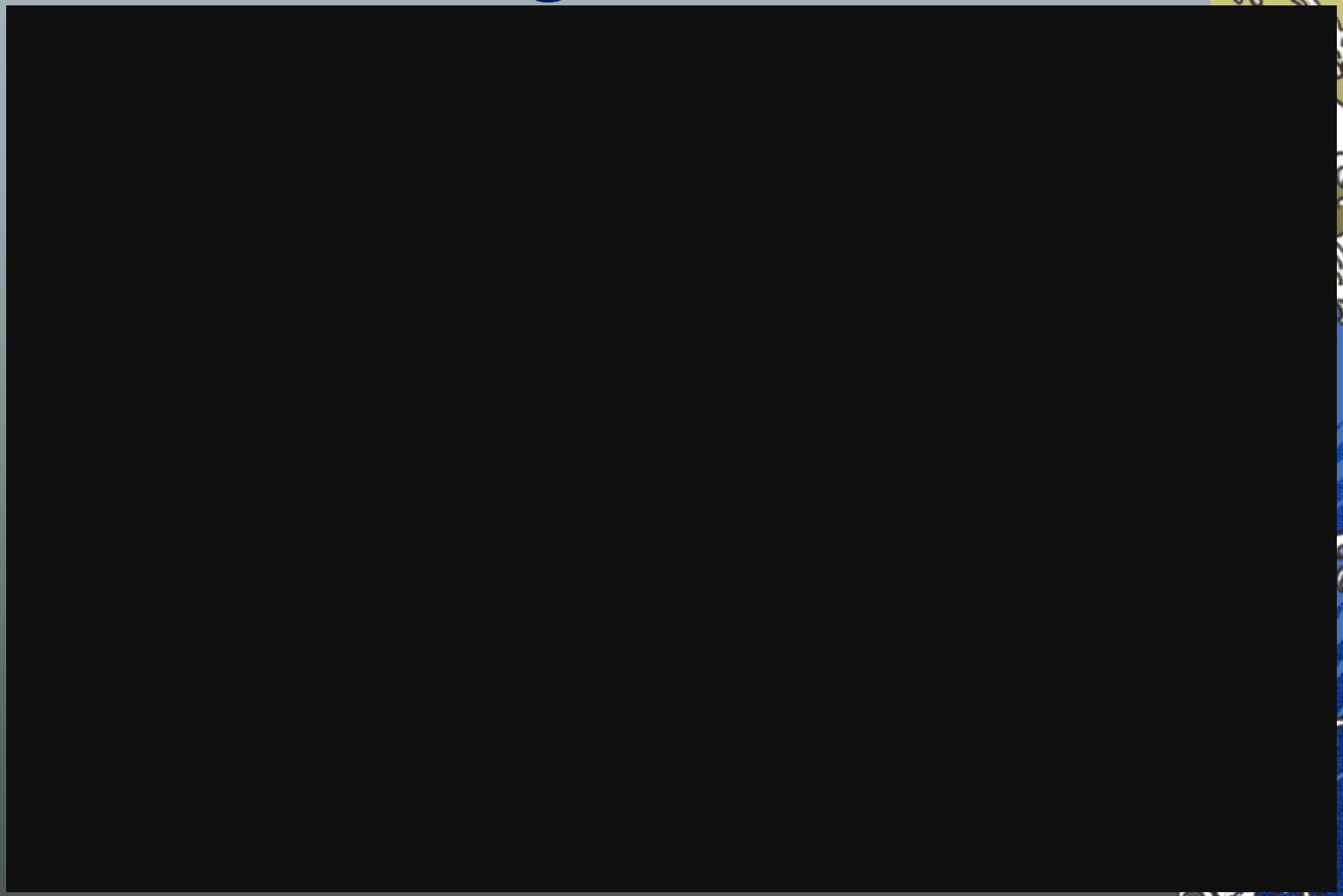
Nearshore Invertebrate Web

Offshore

Linkages

Watersheds

A Swim through the Nearshore



Conceptual design

Density Dependent Effects

Diet and nutrition
Energy recovery
Time budgets
Health &
Body condition

Density Independent

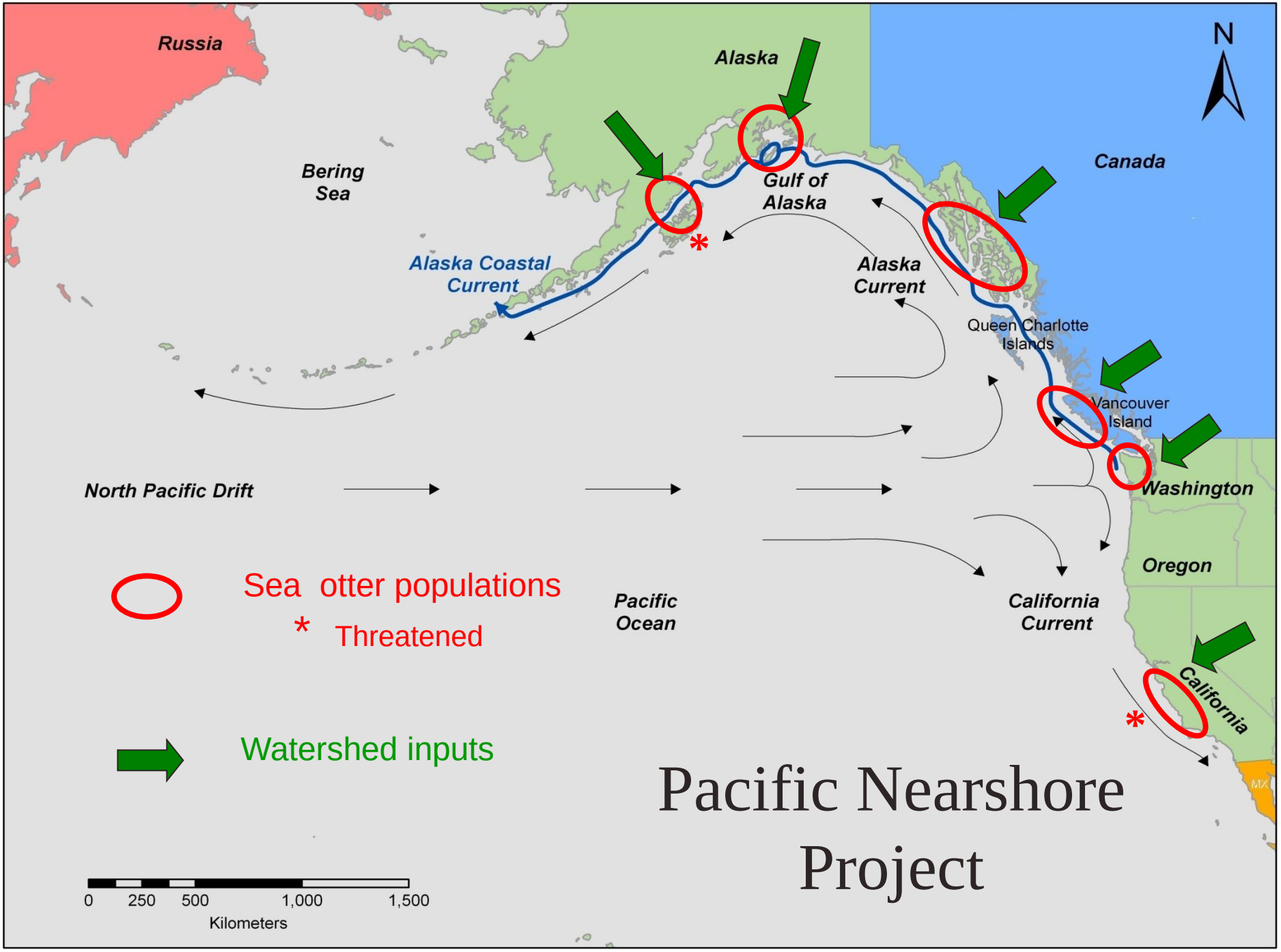
Marine productivity
Growth increments
Satellite imagery
Ocean. stations

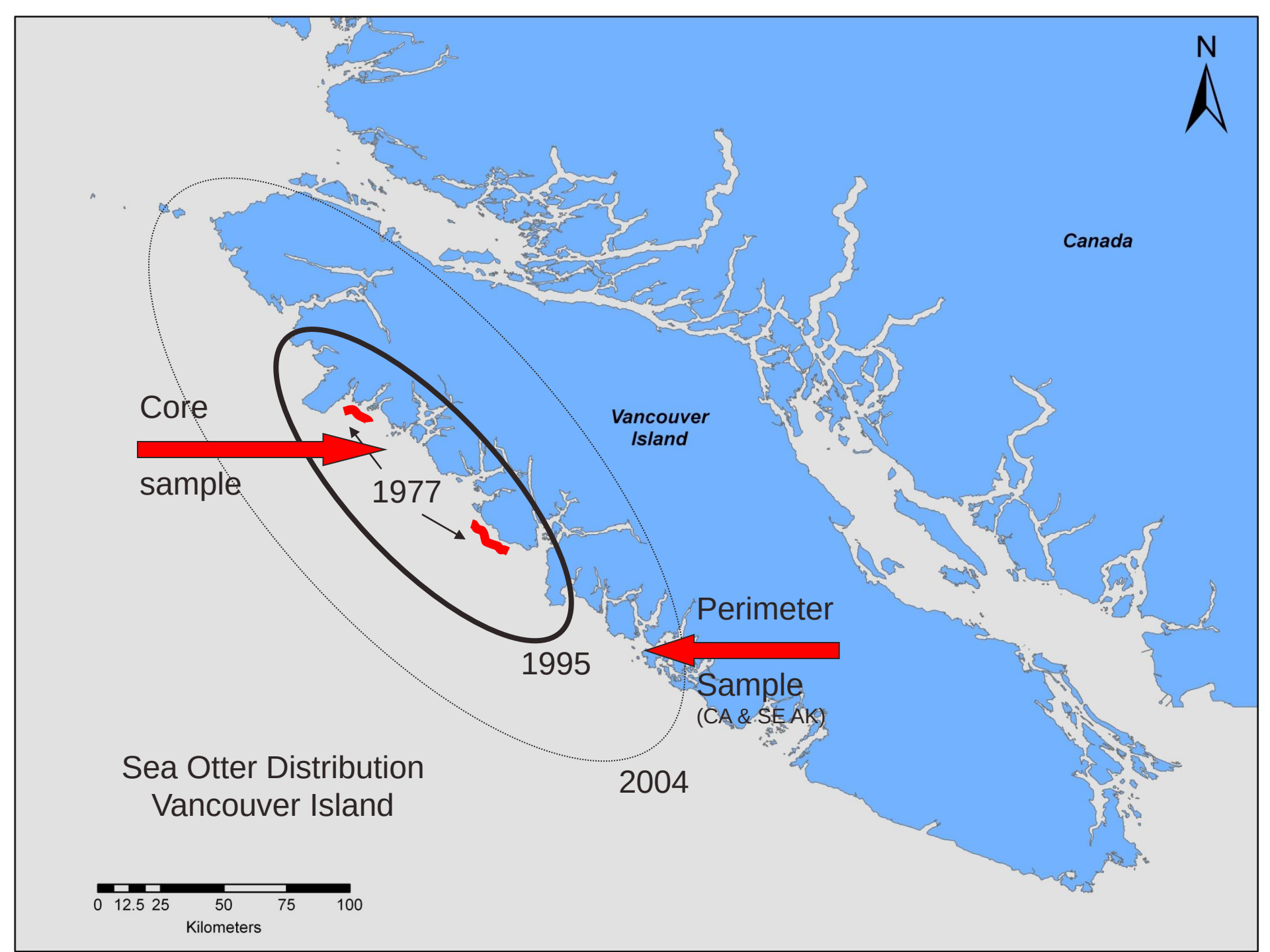
Sea otter population status and trend

Gene expression
Disease
Contaminants
Parasites
Thermal stress

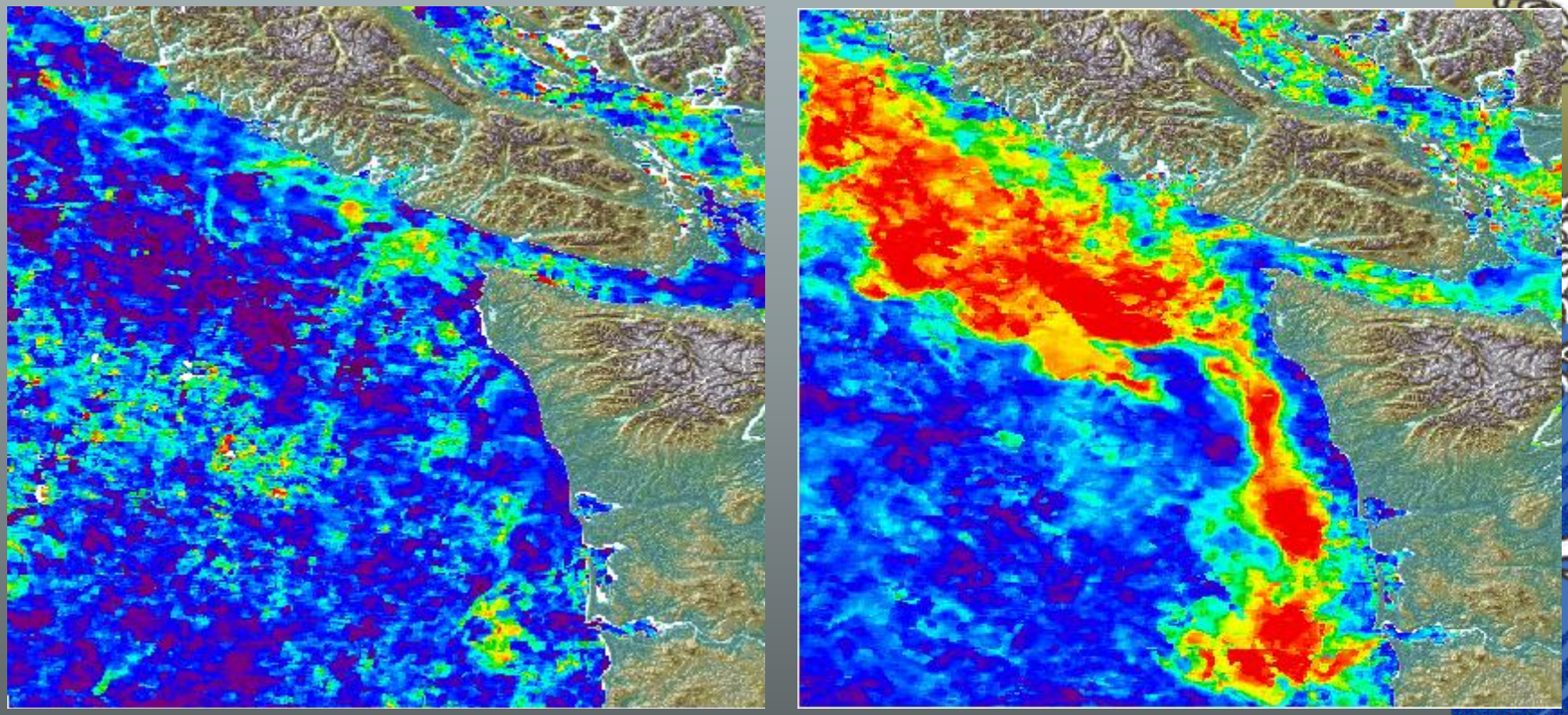
Density Independent

Watershed inputs
Human density
Modified habitat
Industrialization


Russia
Alaska
Bering Sea
Gulf of Alaska
Canada
Alaska Coastal Current
Alaska Current
Queen Charlotte Islands
Vancouver Island
North Pacific Drift
Washington
Oregon
Pacific Ocean
California Current
California
MX
N
Sea otter populations
* Threatened
Watershed inputs
0 250 500 1,000 1,500
Kilometers
Pacific Nearshore Project


N
Canada
Vancouver Island
Core sample
1977
1995
2004
Perimeter Sample
(CA & SE AK)
Sea Otter Distribution
Vancouver Island
0 12.5 25 50 75 100
Kilometers

Ocean Processes: Marine productivity



Ocean productivity (chlorophyll) in the nearshore, March vs May (from Pirhala et al. 2009)

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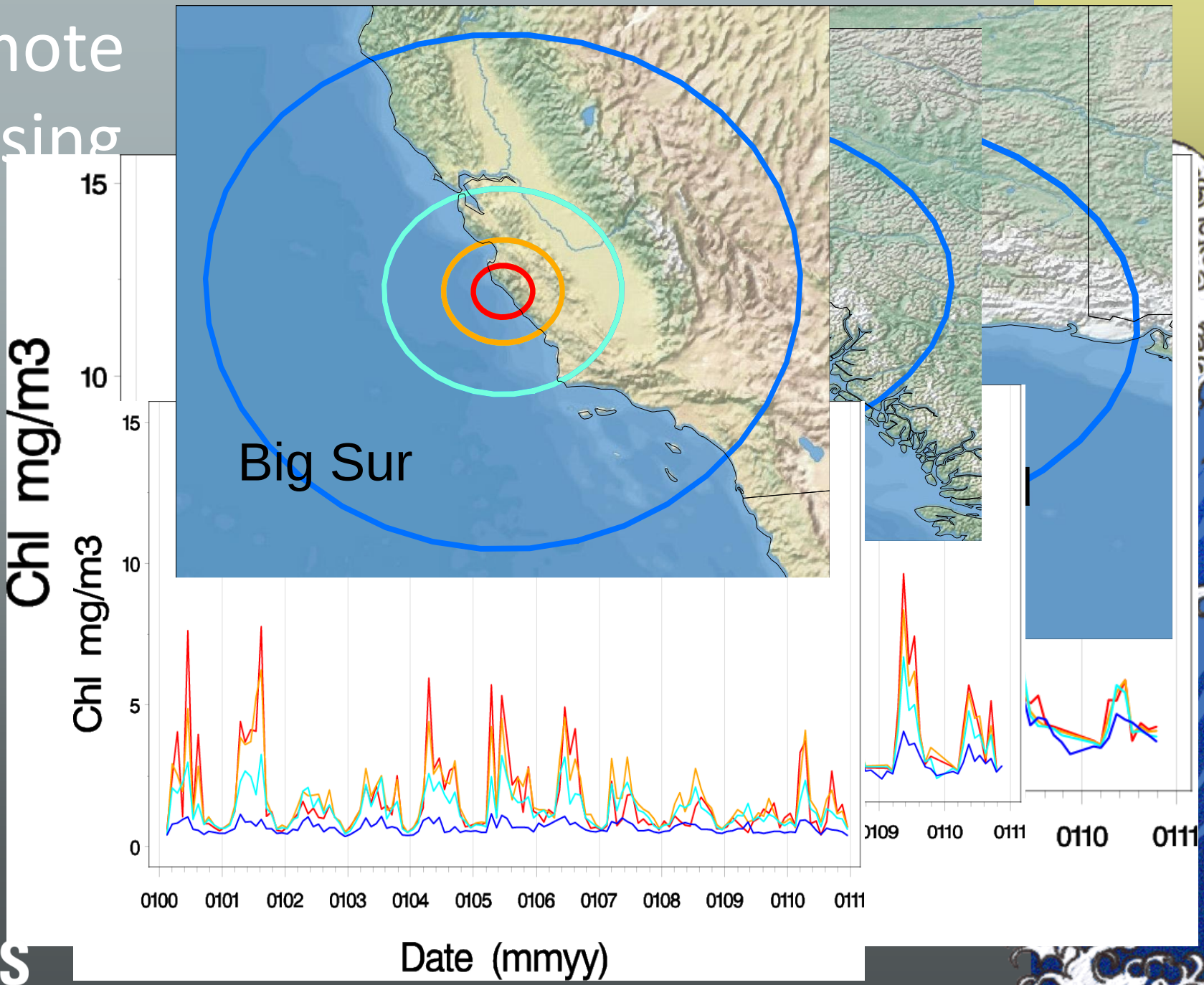
Remote Sensing



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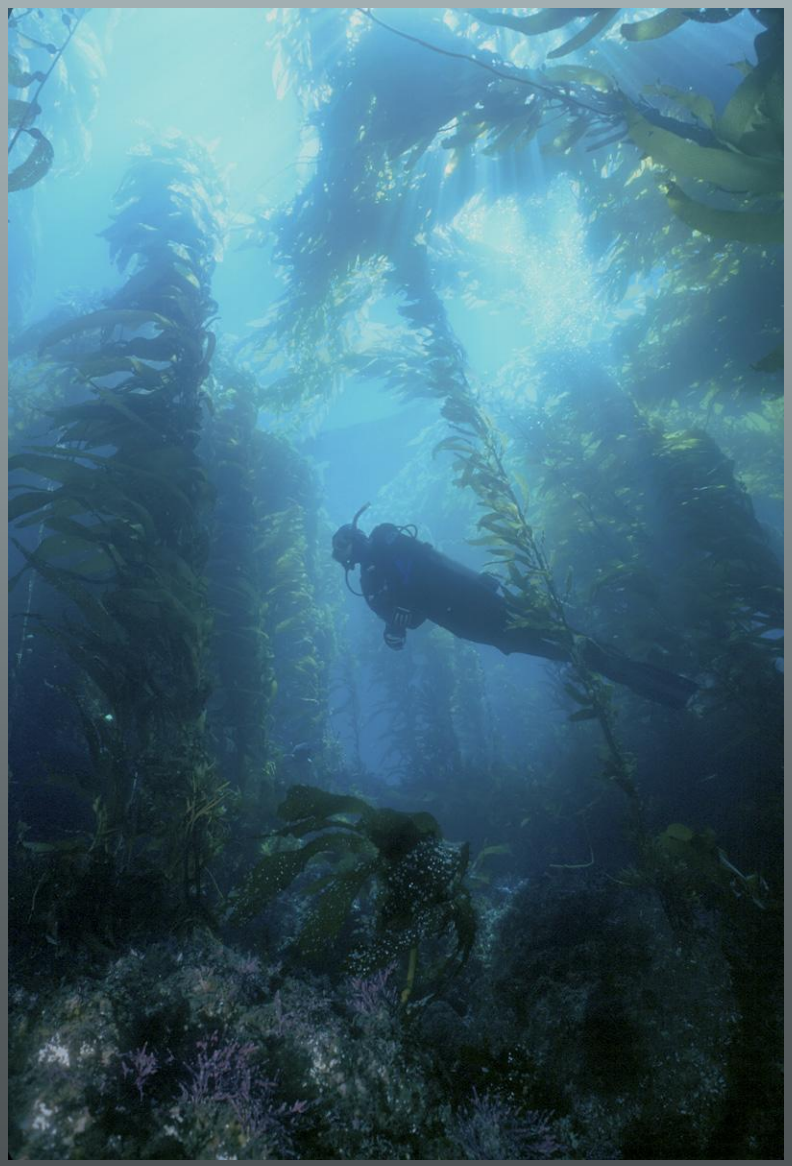
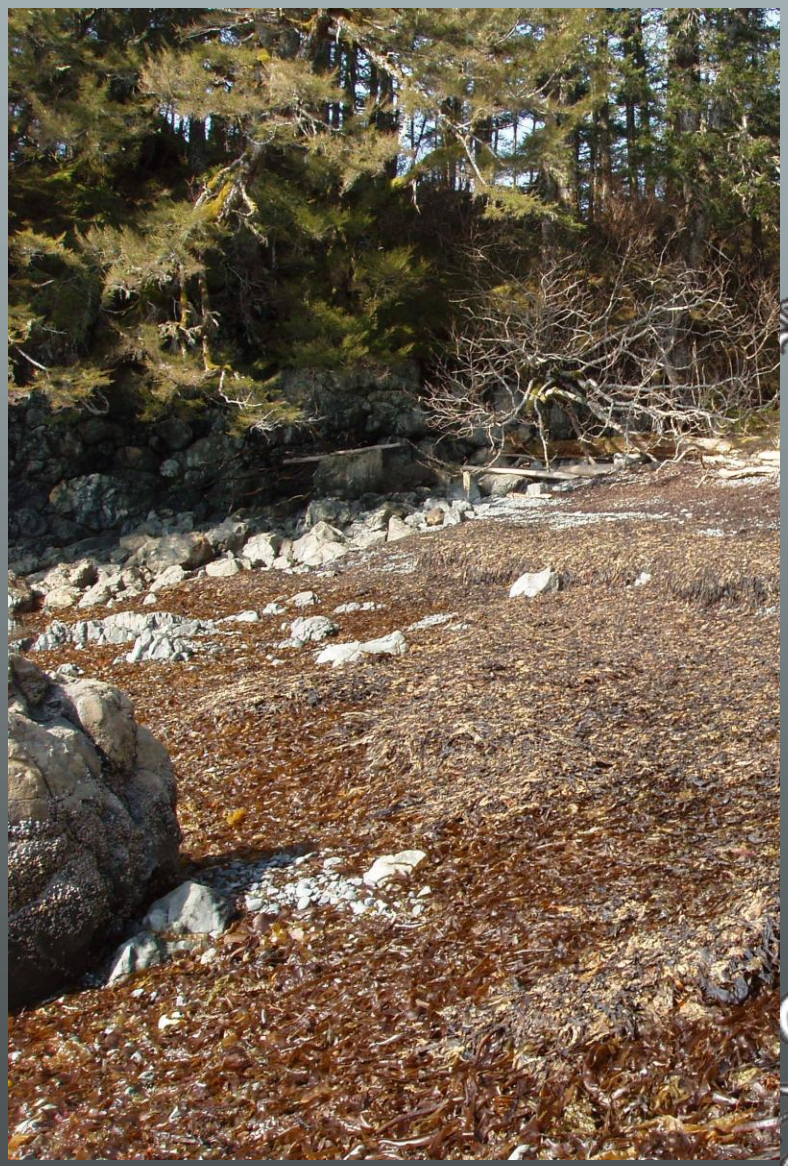
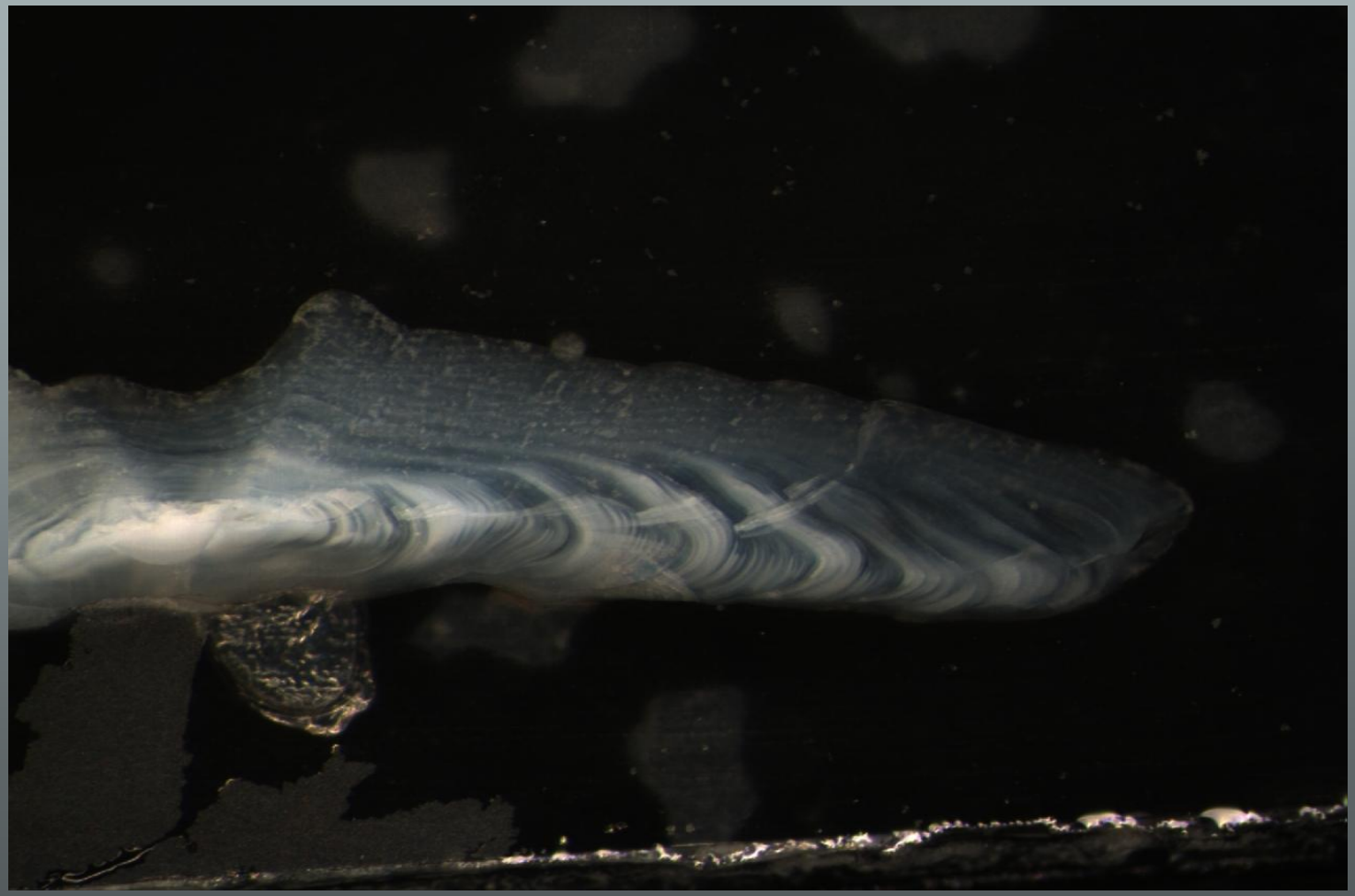
Nearshore derived primary production





Estimates of productivity and oceanic and kelp derived carbon



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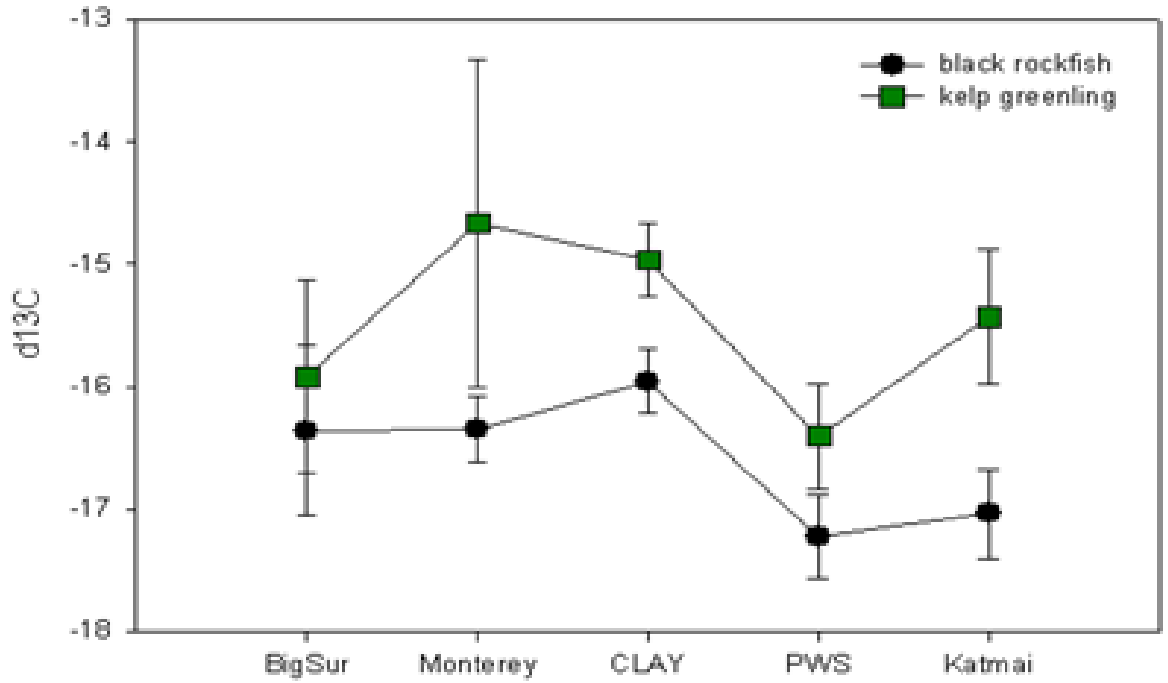
Two Nearshore Residents

Stable Isotope analysis: otters and fish



Watershed Geoaccounting

OUTPUT

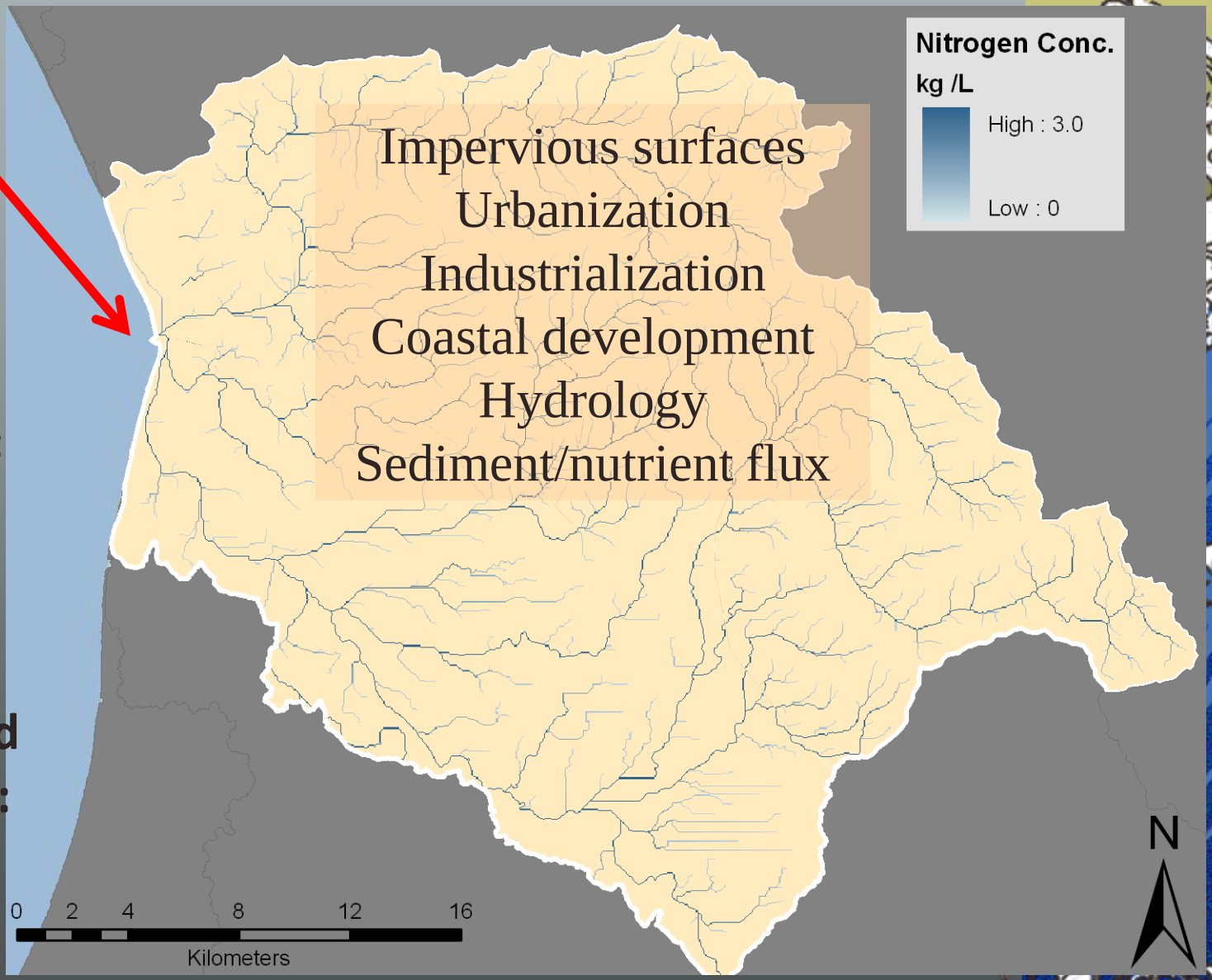
Discharge:
156 m^3 / s

Lead:
0.03 kg

Phosphorous:
0.156 kg

Nitrogen:
0.468 kg

Suspended Sediment:
125 kg



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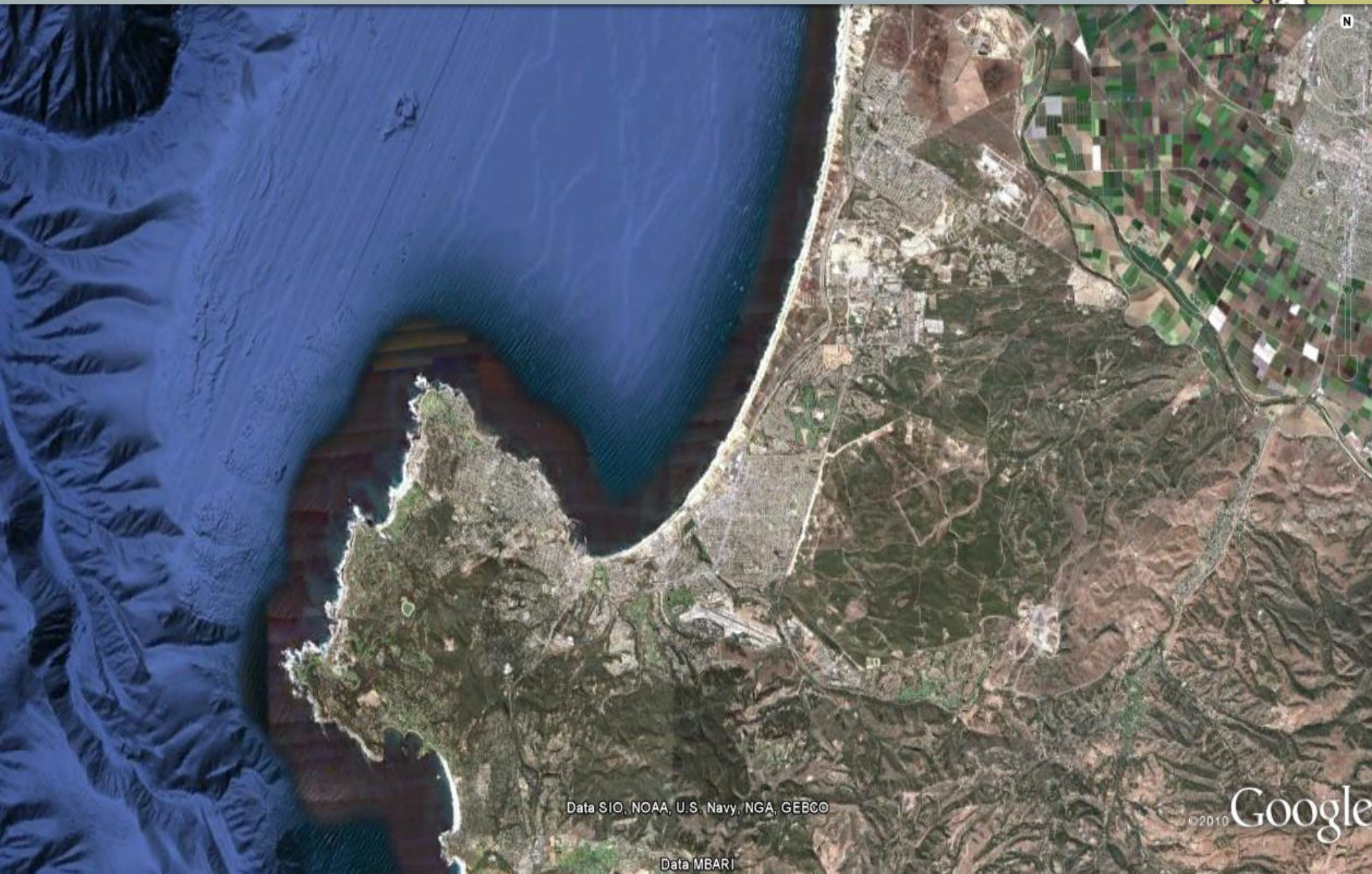
Prince William Sound Site

Monterey Site



The Science in Monitoring

- *Sea otter population LTM*
- *Sea otter diet LTM*
- *Retrospective LTM*
- *Remotely Sensed LTM*

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